

IN THE CLAIMS

What is claimed is:

- 1 1. A method of forming a microelectronic structure comprising:
2 forming a sacrificial layer on a hard mask layer disposed on a
3 substrate;
4 forming a trench in the substrate;
5 forming a metal layer in the trench of the substrate and on the
6 sacrificial layer;
7 removing the metal layer until the sacrificial layer is exposed, and
8 wherein a dishing is induced in a top surface of the metal layer; and
9 then simultaneously removing the metal layer and the sacrificial layer
10 until the dishing in the metal layer is substantially removed without
11 substantially removing the hard mask layer.
- 1 2. The method of claim 1 wherein removing the metal layer wherein a
2 dishing is induced comprises removing the metal layer wherein a dishing
3 depth about equal to or less than the thickness of the sacrificial layer is
4 induced.
- 1 3. The method of claim 1 wherein forming the metal layer in the trench of

2 the substrate and on the sacrificial layer comprises forming a barrier layer in
3 the trench of the substrate and on the sacrificial layer and then forming a
4 metal layer on the barrier layer.

1 4. The method of claim 3 wherein forming a barrier layer comprises
2 forming a barrier layer that is from about 150 to about 350 angstroms in
3 thickness.

4 5. The method of claim 1 wherein forming a sacrificial layer on a hard
5 mask layer disposed on a substrate comprises forming a sacrificial layer
6 disposed on a hard mask layer that is disposed on a dielectric layer.

1 6. The method of claim 1 wherein forming a sacrificial layer on a hard
2 mask layer disposed on a substrate comprises forming a sacrificial layer
3 disposed on a hard mask layer that is disposed on a low k dielectric layer.

1 7. The method of claim 1 wherein simultaneously removing the metal
2 layer and the sacrificial layer comprises simultaneously removing the metal
3 layer and the sacrificial layer at a removal rate that is at least about 10 times
4 faster than a removal rate of the hard mask layer.

1 8. The method of claim 7 wherein simultaneously removing the metal

2 layer and the sacrificial layer at a first removal rate that is at least about 10
3 times faster than the removal rate of the hard mask layer comprises
4 simultaneously removing the metal layer and the sacrificial layer at a removal
5 rate that is from about 50 to about 100 times faster than a removal rate of
6 the hard mask layer.

1 9. The method of claim 1 wherein removing the metal layer until the
2 sacrificial layer is exposed comprises removing the metal layer until a barrier
3 layer is exposed, and then removing the barrier layer until the sacrificial layer
4 is exposed.

1 10. The method of claim 1 wherein simultaneously removing the metal
2 layer and the sacrificial layer until the dishing in the metal layer is
3 substantially removed without substantially removing the hard mask layer
4 comprises simultaneously removing the metal layer, a barrier layer disposed
5 on the sacrificial layer, and the sacrificial layer until the dishing in the metal
6 layer is substantially removed without substantially removing the hard mask
7 layer.

1 11. The method of claim 1 wherein forming a sacrificial layer comprises
2 forming a sacrificial layer that is from about 300 to about 1,000 angstroms in
3 thickness.

1 12. The method of claim 1 wherein forming a hard mask layer comprises
2 forming a hard mask layer that is from about 50 to about 400 angstroms in
3 thickness.

1 13. A method of forming microelectronic structure comprising:
2 providing a substrate, the substrate comprising a trench, a metal layer
3 disposed in the trench wherein the metal layer comprises a dishing on a top
4 surface of the metal layer, and a sacrificial layer disposed on a hard mask
5 layer that is disposed on a first surface of the substrate, and
6 simultaneously polishing the metal layer and the sacrificial layer until
7 the dishing is removed without substantially removing the hard mask layer.

1 14. The method of claim 13 wherein providing a substrate, the substrate
2 comprising a trench, a metal layer disposed in the trench wherein the metal
3 layer comprises a dishing on a top surface of the metal layer, and a
4 sacrificial layer comprises providing a substrate, the substrate comprising a
5 trench, a metal layer disposed in the trench wherein the metal layer
6 comprises a dishing on a top surface of the metal layer, and a sacrificial
7 layer comprising a material selected from the group consisting of non porous
8 spin on glass, undoped silicate glass, tetraethoxysilane, fluorine doped
9 silicon dioxide, carbon doped oxide, silicon carbide, silicon nitride, silicon

10 oxynitride, and silicon carbon nitride, wherein the sacrificial layer is disposed
11 on a hard mask layer that is disposed on a low k dielectric layer.

1 15. The method of claim 13 wherein providing a substrate, the
2 substrate comprising a trench, a metal layer disposed in the trench
3 comprises providing a substrate, the substrate comprising a trench, a barrier
4 layer disposed on the trench, and a metal layer disposed on the barrier layer.

1 16. The method of claim 15 wherein providing a substrate, the substrate
2 comprising a trench, a barrier layer disposed on the trench, and a metal layer
3 disposed on the barrier layer comprises providing a substrate, the substrate
4 comprising a trench, a barrier layer comprising at least one of tantalum,
5 tantalum nitride disposed on the trench, and a copper layer disposed on the
6 barrier layer.

1 17. The method of claim 13 wherein providing a substrate, the substrate
2 comprising a trench, a metal layer disposed in the trench wherein the metal
3 layer comprises a dishing on a top surface of the metal layer, and a
4 sacrificial layer disposed on a hard mask layer that is disposed on a first
5 surface of the substrate comprises providing a substrate, the substrate
6 comprising a metal layer disposed in a trench wherein the metal layer
7 comprises a dishing on a top surface of the metal layer, a sacrificial layer

8 disposed on a hard mask layer comprising at least one of silicon carbide,
9 silicon nitride, silicon oxynitride, silicon carbon nitride that is disposed on a
10 low k dielectric layer.

1 18. A method of forming a microelectronic structure comprising:
2 providing a substrate comprising a sacrificial layer disposed on a hard
3 mask, and a metal layer disposed in a trench of the substrate and disposed
4 on the sacrificial layer;
5 removing the metal layer at a first removal rate until the sacrificial
6 layer is exposed and wherein a dishing is induced in a top surface of the
7 metal layer; and
8 then simultaneously removing the metal layer and the sacrificial layer
9 at a second removal rate without substantially removing the hard mask.

10 19. The method of claim 18 wherein removing the metal layer at a first
11 removal rate comprises removing the metal layer utilizing a chemical
12 mechanical process.

1 20. The method of claim 18 wherein simultaneously removing the metal
2 layer and the sacrificial layer comprises simultaneously removing the
3 metal layer and the sacrificial layer utilizing a chemical mechanical process.

1 21. An intermediate product comprising:
2 a metal layer disposed in a trench of a substrate, wherein the metal
3 layer comprises a dishing in a top surface of the metal layer;
4 a hard mask layer disposed on a first surface of the substrate;
5 a sacrificial layer disposed on the hard mask layer; wherein the ratio
6 of the thickness of the sacrificial layer to the depth of the dishing in the top
7 surface of the metal layer is equal to or greater than about 1:1.

1 22. The intermediate product of claim 21 wherein the metal layer
2 comprises copper.

1 23. The intermediate product of claim 21 wherein the thickness of the
2 sacrificial layer is from about 300 angstroms to about 1,000 angstroms and
3 comprises a dielectric material.

1 24. The intermediate product of claim 21 wherein the thickness of the
2 hard
3 mask layer is from about 50 angstroms to about 250 angstroms.